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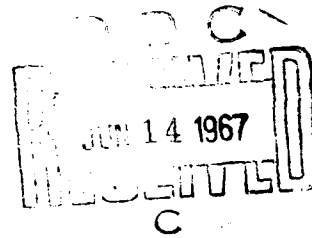
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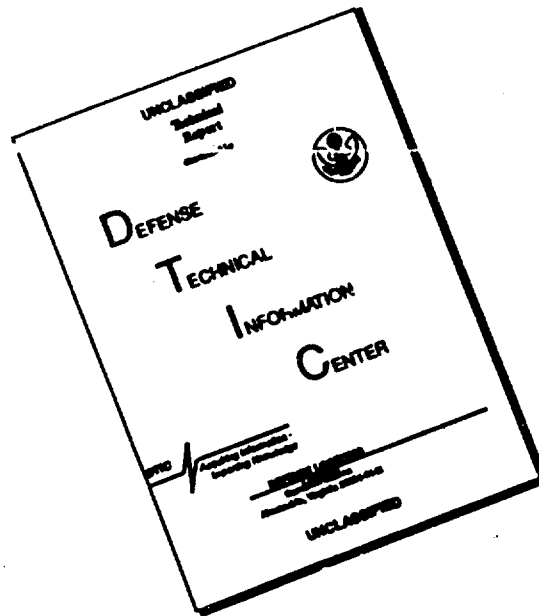


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CONCERNING THE DEFINITION OF THE CONCEPT "EPIDEMIC PROCESS"

/ Following is the translation of an article by N. R. Dyadichev, Kiev Institute of Epidemiology and Microbiology, appearing in the Russian-language periodical Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii (Journal of Microbiology, Epidemiology and Immunobiology), No 6, 1965, pages 145--149. It was submitted on 16 March 1964. Translation performed by Sp/7 Charles T. Ostertag, Jr. /

An infectious disease as the basic nosological unit exists in the form of an epidemic and epizootic process which is characteristic for it, and with which is connected the preservation of its specific causative agent in nature.

The continuity of this process is supported by the presence on the territory of the areal of distribution of the stated infection of more or less favorable conditions for the multiple and fully regular transmission of the pathogenic parasite from infected individuals to all the new susceptible biological hosts. It is understandable that for maintaining the continuity of the stated process, in addition to favorable conditions for the regular transmission of the pathogenic parasite it is necessary to have the constant presence of a sufficient number in the population of susceptible hosts.

These two conditions are obligatory for the existence in nature of any infectious disease and its specific causative agent.

The problem of infectious pathology is the object of many medical and veterinary sciences: Microbiology, parasitology, virusology, immunology, pathology, and clinical aspects of infectious diseases, and partially of other clinical disciplines. The objectives of these disciplines are: Etiology of infections, pathogenesis, and clinical aspects of infectious diseases, immunity and many other problems which concern mainly the regularities of the infectious process.

The subject of epidemiology is the epidemic process (epizootic process) -- the process of the regularities of the existence and distribution of infectious diseases in human society. In other words, epidemiology is engaged in the problem of exposing the infectiousness of infectious diseases in human society.

Many special concepts emerged in the course of development of epidemiology. One of these is the concept of the epidemic process. This term

is very widely used in modern medical literature and speech. However, a generally accepted definition of this concept does not actually exist. On this ground many misunderstandings have been born in the process of development of the theory of epidemiology.

In discussions on the problems of the theory of epidemiology many differences of opinions at first sight are of a terminological nature. Unfortunately these misunderstandings are often the sources of confusion of concepts and concern the very essence of the subject.

Nevertheless what is the epidemic process? What makes up the main, most characteristic traits of this exceedingly complex phenomenon? In order to answer these problems it is necessary to critically evaluate the definition of this concept which is found in the medical press.

As is known, knowledge of the objective reality of nature usually begins with a familiarity with its external aspect, with what is called phenomenon in philosophy. Through phenomenon man penetrates into the essence of objects and processes. For the conception of essence it is not only necessary to see, observe, and describe, but also, what is especially important, to discuss and think.

An understanding of the epidemic process begins with a study of the movement of clinically manifested cases of infection. From this began the development of epidemiology in the earliest phases of human history. And also starting with this in actuality is an understanding of the epidemic process of this or that infection at the present time.

It is true that modern epidemiology, in contrast to that from previous centuries, has at its disposal not only the data concerning the movement of cases of this or that infection, but also the massive material which has been accumulated by mixed disciplines (microbiology, virusology, parasitology, clinical practice, and pathology of infectious diseases, demography, etc.). Besides this, it must be stressed that the basis of modern epidemiology is the successfully developing science concerning the mechanism of transmission of pathogenic parasites. Nevertheless even in our time there is still a tendency to view the epidemic process only as the specific form of movement of infectious diseases.

In actuality, under natural conditions the epidemic process is manifested graphically in the form of the movement of morbidity which is characteristic for a given infection.

Thus, L. A. Belikov (1952), based mainly on this, suggests "that the epidemic process is a form of movement of an infectious disease in human society." In actuality the stated definition of the epidemic process takes into consideration only that it gives in to direct observation and that it is the external aspect of the manifestation of the epidemic process. In

connection with this it is appropriate to remember the famous saying of K. Marx, "If the essence and form of manifestation of objects conform directly, then any science would be superfluous."

In truth, if the essence of such a complex phenomenon as the epidemic process could be reduced to only the movement of infectious diseases, then the study of this process could be limited to statistical methods.

It is understood that the study "of the movement of infectious diseases in human society" is a very important method in understanding the epidemic process. The skillful carrying out of such an investigation, which has a bearing on the comprehension of the main regularities of the epidemic process of a given infection, makes it possible in many cases to disclose the circumstances and causes of the emergence and development of epidemic outbreaks of infectious diseases under certain concrete conditions; by such a method it may be possible to expose the sources and individual factors of the distribution of infection.

Under natural conditions various natural and social factors in the most diverse combinations act on the epidemic process. Therefore, the movement of cases of clinically manifested infections is observed in the most diverse forms (without speaking of a change in the nature of distribution of an infection in a historical aspect, there are changes seasonal in the movement of infectious morbidity, epidemics of various dimensions, sporadic morbidity, differences in the contingents of the population affected, etc.).

V. M. Zhdanov (1959) has a completely different approach to the definition of the concept of epidemic process. He regards the stated process as a biological-ecological phenomenon. In his opinion, "the epidemiology of an infectious disease is the manifestation of the ecology of the causative agent in human society."

A rational grain is found in this definition. Epidemiology cannot ignore the ecology of the pathogenic parasite if it pretends to be a modern science, taking into consideration the general biological aspect of the object under study. The ecological principle, based on a study of the mechanism of transmission, makes it possible to explain the historical origin of the parasitic species, and without this, as is known, it is difficult to understand the biological nature of the causative agent of an infectious disease.

The most important mission of ecology is the discovery of the regularities of existence of a species, and the detailed investigation of the natural combination of ecological factors which are the basis of existence of the given species in nature. An uncovering of these bonds guarantees the possibility of influencing the course of the dynamics of species population in this or that direction. In particular, the theoretical bases of the

problem of the liquidation of infectious diseases also cannot be successfully developed without a knowledge of the ecology of the causative agent of the infection which is subject to liquidation.

Consequently the ecological principle may be used with success in the study of epidemic phenomenon. This, without a doubt, enriches the possibility of the development of the theory of epidemiology, which by no means excludes the necessity of investigating the role of social factors in the epidemic process, and on the other hand will even promote the disclosure of the actual role of these factors.

Nevertheless, the reduction of the concept of the epidemic process to the ecology of the causative agent of the infectious disease in human society cannot be accepted as satisfactory, since this definition takes in only a unilateral consideration of the ecology of the causative agent. In actuality the existence of the causative agent of an infection is intimately connected with a specific biological host. Being found in the organism of a host (man, animal), the pathogenic parasite is residing in a medium which is actively reacting antagonistically to its presence. Externally this is manifested in the form of this or that level of pathology of the host's organism.

In other words, the pathogenic parasite tangibly manifests itself in the epidemic process as the causative agent of an infection only in an interaction with a specific biological host which is susceptible to this infection.

In contrast to freelifving species, parasitic organisms in their existence are permanently bound with the organism of the appropriate biological host. This dependency is manifested not only in the periods of the direct residence of the parasite in the organism of the host, but also during its crossover from one host individual to another. Here the regular nature of the mechanism of transmission of the parasite usually is realized at the expense of the ecological ties of the organism of the host with the surrounding environment. In other words, the biology and ecology of the pathogenic parasite are conditioned not only by the peculiarities of the direct parasitism of the microorganism in the organism of the biological host, but also by the ecology of the latter.

The ecology of the pathogenic parasite may be disclosed through the ecology of its biological host. In essence there is no independent ecology of a pathogenic parasite. Such a parasite, even being outside the organism of the host, is bound with the latter through its ecology, in the sphere of which the parasite is found at the moment of transmission from one specimen of the host to another. It is understood that for the transmission of a parasite those ecological ties are used which bear a completely regular nature, are repeated constantly and are obligatory for the organism of the host. Included in their number are the specific blood sucking carriers and also other intermediate hosts.

I. I. Yelkin (1960), in criticizing the German epidemiologist Muller in this connection, points out very rightfully that, "the emergence and development of an epidemic is connected not with the appearance and circulation in the human collective of the microbe-causative agent, as is said in a "naked form", but with the appearance and circulation in the human collective of infected organisms (man, animals)."

Thus, the ecology of the pathogenic parasite which causes an infectious disease in man is very intimately interwoven with the "specific ecology" of the host itself (man as the biological host of the stated parasite) or of those animals from which man can receive the causative agent of the infection.

I. I. Yelkin (1956) points out that "the epidemic process is a chain of epidemic foci, connected together and arising one from the other." Such a definition would be convenient, and particularly applicable to antiepidemic practice. But unfortunately the very concept "epidemic focus" is difficult to present in a generalized form. It may be defined in a more or less concrete form only in those infections during which the mechanism of transmission of the causative agent is attached to the source of infection (as an example, in infections of the respiratory tract, etc.). But even with these infections, in connection with the usual mobility of the source of the pathogenic onset, a determination of the limits of the focus causes unavoidable difficulty.

Still more complex is the definition of the concept of an epidemic focus in those infections during which the process of transmission bears a lengthy nature, both in time and in space (tick-borne infections, diphyllorhynchiasis, etc.).

During infections in which the causative agents are transmitted by specific flying blood-sucking carriers, concepts concerning the epidemic focus run together with concepts concerning the natural focus, or even concerning the territory of the entire areal of the stated infection.

The above cited definitions reflect the more or less important substance of the epidemic process. In each of these any feature of this complex process found expression.

Unfortunately, in the cited definitions the mechanism of transmission of the causative agent of an infection did not find any expression at all. But meanwhile, the main characteristic traits of the epidemic process are bound primarily with the peculiarities of the mechanism of transmission of the causative agent of the given infection. Here the mechanism of transmission causes not only the specific epidemic process, but it is the main active moving force of this complex process, its winding spring, without which all the remaining elements of the epidemic process cease to exist in cooperation as a united complete process.

As part of the development of sciences which are connected with the study of infectious pathology of man, all the more the individual elements of the epidemic process are being subjected to direct observation and investigation, in particular under laboratory conditions, in clinical practice, and under the natural conditions of the human collective. However, since it takes place under natural conditions, the epidemic process as a whole is not encompassed by direct observation and investigation. Our attention is usually fixed on the external manifestation of this complex process (the movement of infectious morbidity and the individual factors of the external medium connected with it, the biological peculiarities of the causative agent of the infection, is it possible to detect it, and the nature of the course of infection).

"The mission of science," writes K. Marx, "consists of the apparent, but outstanding in appearance, movement to converge to a real internal movement."* In the epidemic process this "internal" is connected, without a doubt, with the mechanism of transmission of the pathogenic parasite from one individual of the biological host to another. Also connected with the mechanism of transmission is the localization of the causative agent of the infection in the organism of the host. To a significant degree the mechanism of transmission predetermines the peculiarities of the pathogenesis of the infection.

*K. Marx and F. Engels, Collected Works, 2nd Printing, vol 25, part I, p 343.

Thus, the mechanism of transmission, which is the main moving force influencing all the elements of the epidemic process, determines the specificity of the stated process on the whole during each individual infection. And what is more, the historical emergence and then the preservation of the very pathogenic parasitic organisms became possible only following the fact that in nature conditions were created for the regular realization of the mechanism of transmission which was characteristic for the stated infectious form.

Misunderstandings by several investigators of this particular role of the mechanism of transmission in the epidemic process lead them to an idolization of the microbe-causative agent of the infection or to an incorrect evaluation of the role of susceptible contingents in the stated process. Finally, this leads to a shadowing out of the role of the source of infection in the epidemic process.

Misunderstanding of the real role of the mechanism of transmission compels some investigators to search for the moving forces of the epidemic process in some factors which do not yield to investigation and are superficial in respect to the stated process. Here it is necessary to disregard the specificity of the epidemic process of separate infectious diseases which is apparent for all.

It is not by chance that in many general theoretical works by foreign authors, often only two basic factors of the epidemic process are figured on -- the causative agent of the infection and the susceptible contingents of people. On the basis of a change in the relationship of these factors, attempts are being undertaken to build up a theory of moving forces of the epidemic process.

Thus, one author considers that a change in the virulence of the causative agent of an infection is the main reason for the strengthening or weakening of the intensity of the epidemic process. Others explain the development of epidemics as a result of the unexpected increase in the mass of causative agent of the infection, circulating in the human society, which would take place under the influence of external factors which do not yield to investigation at all. Among these are mentioned telluric, cosmic, etc. (Techueyres, 1952, and others).

Finally there are those authors who propose that the moving force of the epidemic process is the "pressure of the growing mass of the population (Bowes, 1946, and others). In connection with this, attempts are being made to evaluate the possibilities of combatting infectious diseases from positions of Malthusianism.

The last examples of the interpretation of the nature of the epidemic process reveal not only misunderstandings, but are completely ignorant of the mechanism of transmission. From here emanates the apparent helplessness of a similar type of investigators in attempts at constructing a scientific theory for the epidemic process.

Ignoring the problem of the mechanism of transmission of the causative agents of infectious diseases inhibits the correct evaluation of the role of social factors in the epidemic process.

The epidemic process is a complex phenomenon and therefore it is no wonder that the formulation of a brief and at the same time more or less exhaustive definition for it is so difficult.

Perhaps the most successful is the definition presented in the book by L. V. Gromashe'skiy (1949), "General Epidemiology." "...the continuous process or chain of specific infectious conditions (patients, carriers) following one behind the other and representing an epidemic process or epidemic (in the wide sense of the word)."

In this definition one of the most important peculiarities of the epidemic process found expression: "the process....of specific infectious conditions following one behind the other," which are the main links of the stated process and represent its most important epidemiological elements (sources of infection).

The doubtless virtue of this definition is its brevity. However, connected with this is the fact that it does not reflect the mechanism of transmission, the peculiarities of which cause the specifics of the epidemic process of each individual infectious disease. It also does not reflect the parasitic nature of the infectious disease.

Consequently, this definition can be placed in the foundation of a more developed definition of the epidemic process concept. Unfortunately in the brief form presented it does not exclude the possibility of the emergence of several misunderstandings in the interpretation and definition of the nature of the stated phenomenon, and also in the definition of the very subject of epidemiology as a singular medical scientific discipline.

In conclusion it is necessary to stress that modern science stems from the provision concerning the parasitic nature of all causative agents of infectious diseases of man and animals, and also of plants. Epidemiology, just as epizootology, takes interest primarily in those antagonistic forms of biological parasitism which are accompanied by this or that level of pathology of the biological host of the appropriate parasites (man, animal). This is usually accompanied by the characteristic clinical picture of infection.

The term "biological parasitism" (Skryabin) reflects not only the interaction of the causative agent of the infection and its host, but also the historical origin of this process, just as of any other complex biological phenomenon.

In our opinion the biological essence of the epidemic process should be viewed as the manifestation of biological parasitism in human society, and not simply as the "manifestation of the ecology of the causative agent in human society," as this is proposed by V. M. Zhdanov.

This definition considerably more broadly and accurately discloses the biological essence of the epidemic process, in which the causative agent of the infection and its biological host are viewed in an interaction, that is, as they appear in actuality, under the conditions of the natural flow of the epidemic process.

The very name "epidemic process" contains an indication that this process takes place in human society, and consequently is subject to the influence of various social factors as well as natural. In other words the manifestation of the epidemic process depends on the social-economic conditions of life of the people.

Thus, on the basis of the reasons presented, a brief and more or less exhaustive definition of this concept may be reduced to the following: The epidemic process is the manifestation of biological parasitism in the form of a continuous process of specific infectious conditions (patients, carriers) following one behind the other, and sustained by a mechanism of transmission which is characteristic for the stated infection.

During infections which are common for man and higher animals (zoonoses), the epidemic process is sustained by the epizootic process, and in some infections there is a cross interaction of the epidemic and epizootic processes (tuberculosis, taeniasis, etc.).

Of course this is far from exhausting the entire essence of the phenomenon of the process as defined by us. For science "a uniquely real definition," writes F. Engels, "turns out to be the very essence of the affair, and this already is not a definition." "But for common use a brief indication of the most general and at the same time most characteristic distinctive features in the so-called definition often is useful and necessary, if only from the definition they do not demand that it give, and what is more, be expressed in the condition."**

The brief definition of the concept of the epidemic process proposed includes the main, most important characteristic features of this process. In any case, this definition is mainly directed correctly in the sense that it should be implied under the term "epidemic process." The correct concept of the essence of the stated process has very important significance both for the development of the theory of epidemiology and for its practice.

* F. Engels and F. Engels, Collected Works, 2nd Printing, vol 20, pages 634--635.

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